STRATEGY RESEARCH PROJECT

STRATEGIC IMPORTANCE OF THE US ARMY VETERINARY SERVICE IN AN NBC ENVIRONMENT

BY

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USAWC CLASS OF 1999

U.S. ARMY WAR COLLEGE, CARLISLE BARRACKS, PA 17013-5050

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Strategic Importance of the US Army Veterinary Service in an NBC Environment

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ABSTRACT

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TITLE: Strategic Importance of the U.S. Army Veterinary Service in an NBC Environment

FORMAT: Strategy Research Project

DATE: 1 April 1999 PAGES: 41 CLASSIFICATION: Unclassified

As the Department of Defense Executive Agent for Veterinary Services, the U.S. Army Veterinary Service has responsibility for providing support to all branches of the Department of Defense. That support includes food safety and quality assurance; zoonotic disease control and prevention; medical research and development; and medical care for all government owned animals. This paper reviews the role of the U.S. Army Veterinary Service in an NBC environment as it relates to food safety and quality assurance. The focus of the paper is to examine the current threat from weapons of mass destruction, our doctrine for subsistence and water operations in an NBC environment, and the current capabilities of US forces to detect NBC agents in subsistence and water. A recommendation for a course of action to address the current shortcomings in doctrine and equipment is developed.

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ACKNOWLEDGEMENTS

Sincere gratitude is expressed to Colonels Bill Barko and Clyde Hoskins for their advice and assistance in preparing this manuscript. I also wish to thank Colonel John Wade for his efforts in reviewing this document and providing ideas for recommendations. Their assistance made this effort a better product. I also wish to thank my wife Ellen whose support and understanding made this project possible.

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LIST OF TABLES

STRATEGIC IMPORTANCE OF THE US ARMY VETERINARY SERVICE IN AN NBC ENVIRONMENT

This paper will examine the past and current threats from weapons of mass destruction (WMD), U.S. doctrine for subsistence and water operations in a nuclear, biological, or chemical (NBC) environment, and the current capabilities of U.S. forces to detect NBC agents in food and water. It will address the changes in doctrine, force structure, and/or equipment needed in order for the U.S. Army Veterinary Service to be effective in a future NBC environment.

BACKGROUND

> Weapons of mass destruction pose the greatest potential threat to global security. We must continue to reduce the threat posed by existing arsenals of such weaponry as well as work to stop the proliferation of advanced technologies that place these destructive capabilities in the hands of parties hostile to US and global security interests. Danger exists from outlaw states opposed to regional and global security efforts and transnational actors, such as terrorists or international crime organizations, potentially employing nuclear, chemical or biological weapons against unprotected peoples and governments.
>
> — William J. Clinton

Weapons of Mass Destruction

The use of nuclear, biological, and chemical (NBC) weapons has been recorded numerous times throughout man's history. Today, these weapons are termed weapons of mass destruction. The prevention of their use is one of the cornerstones of our National Security Strategy.[1] Their past use occurred both as a part of military operations and as terrorist actions.

The United States became the only country to use nuclear weapons in combat when a lone American B-29 dropped an atomic bomb on Hiroshima, Japan on August 6, 1945. On August 9th, another B-29 dropped a second atomic bomb on Nagasaki, Japan.[2] Japan surrendered the next day.

Biological warfare's first recorded use was during medieval times when human cadavers were catapulted over castle and fortress walls with the intention of spreading disease. In 1346, plague broke out in the Tartar army attacking Kaffa in current day Crimea. Attackers hurled the bodies of those who had died from plague into the city starting an epidemic that forced the defenders to surrender. Animal carcasses have been used to contaminate wells and other water sources of armies and civilian populations from antiquity into the 20th century.[3] The British used smallpox as a biological weapon against Native Americans during the French and Indian War. In 1763, the British gave blankets and a handkerchief from a smallpox infected hospital at Fort Pitt. This "gift" was followed by an epidemic of smallpox among Native American tribes in the Ohio River Valley. More recently, the Japanese attacked at least 11 Chinese cities with biological agents during World War II. The Japanese also killed over 10,000 prisoners by experimental infection or execution following experimentation from 1932 to 1945.[4]

Chemical warfare, as a science, is relatively modern. However, using weapons of chemical origin is not a new concept. Their use as a military tactic dates back to 600 BC when Solon contaminated the River Pleisthenes with skunk cabbage (hellebores) to give the defenders of Kirrha violent diarrhea leading to their defeat.

The first recorded use of poisonous gases occurred from 431-404 BC during the Peloponnesian War. During the siege of the cities of Platea and Pelium, the Spartans burned wood saturated with sulfur and pitch to produce sulfur dioxide gas. A sudden rain spoiled the first attack, but five years later the same type of attack was a complete success. In 200 BC, a Carthaginian general ordered a retreat, leaving behind a large quantity of wine poisoned with a narcotic called mandragora. After the enemy soldiers drank the wine and fell asleep, the Carthaginians returned and massacred them. The first large-scale use of gas occurred on April 22, 1915 when the Germans dispersed 168 tons of chlorine gas against the French salient at Ypres. This attack achieved total surprise, but the German High Command failed to exploit its initial success by failing to provide adequate reserves. The attack at Ypres resulted in over 5,000 allied casualties, as well as the loss of 60 guns and huge quantities of supplies.[5]

This attack lead to the development of the first protective masks. Soon after the development of "gas masks", the search began for ways to defeat the masks. The most successful gas developed was mustard, which was first used by the Germans in 1917. During the period between the "Great Wars", old chemical weapons continued to be manufactured and new ones continued to be developed. In 1935, the Italian Army used mustard gas in their invasion of Ethiopia and in 1938, witnesses from China accused the Japanese of using mustard gas on the Chinese mainland. Germany developed the new nerve agents tabun in 1936 and sarin in 1938.[6]

During World War II, Korea, and Vietnam NBC weapons were not used, with the exception of fecal contaminated punji sticks by the Viet Cong and North Vietnamese Armies. During the Gulf War, U.S. and allied forces had to deal with the threat of Iraqi use of NBC weapons since Iraq had used chemical weapons both against Iran and its own Kurdish population during the 1980s.

Food Safety

Food and water availability and safety have been important concerns for military planners for centuries. Rhazes, a tenth century clinician who discussed military hygiene, stated that food and drink cause many diseases and should be inspected with great caution.[7] It is generally accepted that in most conflicts more military personnel are lost to disease than to contact with the enemy.[8] This was certainly true prior to the 20th century.

Early in the history of the United States, General George Washington realized the importance of a safe food supply to the Continental Army. As one of his first actions as Commander-in-Chief, General Washington issued orders that the officers commanding companies should conduct a daily inspection of the camp kitchen. These officers were also to insure that their men prepared wholesome food. In addition, near the end of the war because of the poor quality of the beef received, he directed that all cattle purchased as food for the army be inspected before or at the time of purchase.[9]

The significance of safe food and water in the conduct of military operations has continued to grow in importance throughout our country's history. During the

American Civil War, the Army required inspection of rations before the award of a contract and periodically during delivery. These rations were inspected for wholesomeness and compliance with the provisions of the contract.[10] American forces in the Spanish American War continued to have problems obtaining safe food. Following the investigation of the "embalmed meats" delivered to American forces in Cuba, the Army expanded the Veterinary Service's role to include food inspection. During World War I, Congress passed legislation authorizing the establishment of a permanent Army Veterinary Corps. This legislation included authorization for seven veterinarians as inspectors of meat for the Quartermaster Corps.[11]

The disaster that befell the German Army during the invasion of Russia demonstrated the importance of supplies, including food, in World War II. Poor weather, extended supply lines, and the "scorched-earth" policy adopted by the Russians as they retreated toward Moscow combined to cause a calamitous collapse in the resupply of food and other classes of supply to German soldiers on the Eastern Front.[12]

Concerns about food and water supplies continue to be voiced by our military leaders today. During Operation Desert Storm, the major challenges facing soldiers and their leaders were not enemy action but rather safe food and water, shelter, and sanitation. One important lesson learned from Operation Desert Shield/Desert Storm was that food safety experts need to be built into the Time Phased Force Deployment Data (TPFDD) list early in any future deployments.[13] [14]

Since food-borne diseases are one of the most common causes of acute illness and are often unrecognized, planning for a safe food supply must be an integral part of any military operation.[15] This is especially true today when many of our deployments are into developing countries or areas affected by natural or man-made disasters. These deployments may result in direct combat operations or Operations Other Than War (OOTW). Regardless of the type of operation conducted, sanitation in these areas is frequently neglected and locating safe food sources in these environments can be a significant challenge.

THE CURRENT THREAT

> The May 1997 Report of the Quadrennial Defense Review (QDR) concluded that the threat or use of nuclear, biological, or chemical (NBC) weapons is a likely condition of future warfare and could occur in the early stages of war to disrupt U.S. operations and logistics. These weapons may be delivered by ballistic missiles, cruise missiles, aircraft, special operations forces, or other means.[16]
>
> —William Cohen

Nuclear Threat

Nuclear warfare is the most destructive threat we face today. Because today's weapons are so advanced, the blast effects and residual fallout from a nuclear detonation could be many times greater than weapons detonated near the end of World War II. Military planners recognize the decisive nature of the use of nuclear weapons against their adversaries, and several of our potential enemies are making great efforts to procure these weapons. Nuclear targeting priorities include command and control centers, troop concentrations, logistics facilities, prepared

defensive positions, and nuclear delivery means.[17] Our most likely adversaries, except Syria, either currently possess nuclear weapons or are trying to develop or acquire them.[18] Table 1 summarizes the current nuclear threats.

North Korea	• Signed the 1994 Agreed Framework, freezing nuclear weapons material production at the Yongbyon complex. • Produced enough plutonium prior to 1994 for at least one nuclear weapon. • Ratified the Nuclear Non-Proliferation Treaty. Has not signed the Comprehensive Test Ban Treaty.
China	• Completed series of tests in 1996. • Deployed over 100 warheads on ballistic missiles. • Maintains stockpile of fissionable material. • Ratified the Nuclear Non-Proliferation Treaty. Signed the Comprehensive Test Ban Treaty.
Iran	• Attempting to acquire fissile material for weapons development. • Chinese and Russian support are the key to Iran's success. • Ratified the Nuclear Non-Proliferation Treaty. Signed the Comprehensive Test Ban Treaty.
Iraq	• All fissile material removed after the Gulf War. • Retains considerable expertise and documentation. • Infrastructure degraded during Operation Desert Fox. • Could manufacture fissile material within five years if sanctions were lifted and foreign assistance provided. • Ratified the Nuclear Non-Proliferation Treaty. Has not signed the Comprehensive test Ban Treaty.
Libya	• Has long-standing goal of acquiring nuclear weapons. • Suffers from poor management and little foreign assistance. • Ratified the Nuclear Non-Proliferation Treaty. Has not signed the Comprehensive Test Ban Treaty. • Signed the African Nuclear Free Zone Treaty.
Syria	• Is not pursuing development of nuclear weapons. • Ratified the Nuclear Non-Proliferation Treaty. Has not signed the Comprehensive test Ban Treaty.
Russia	• Reduced operational strategic warheads by 40 percent since 1991. • All strategic and tactical nuclear warheads from the former Soviet Union are consolidated in Russia. • Ratified the Nuclear Non-Proliferation Treaty. Signed the Comprehensive Test Ban Treaty.

Table 1. Nuclear Weapons Programs

Chemical Threat

Today a number of nations are known to possess stocks of chemical agents. Any nation with an industrial chemical base is capable of producing chemical agents. The employment of chemical weapons offers an adversary a number of advantages. They are rapid acting and very effective when employed against an unprotected population. They are also effective when employed against prepared forces because of the resulting degradation of combat effectiveness. Furthermore, chemical agents can demoralize and/or panic an enemy and are effective in preservation of structures.

North Korea	• Produces and is capable of using a wide variety of chemical agents with multiple delivery means. • Has not signed the Chemical Weapons Convention.
China	• Produces and is capable of using a wide variety of agents and delivery means. • Ratified the Chemical Weapons Convention.
Iran	• Employed chemical agents on a limited scale during the Iran-Iraq War. • Produces chemical agents and can use on a limited scale. • Seeking independent production capability. • Ratified the Chemical Weapons Convention.
Iraq	• Despite Coalition bombing, UNSCOM destruction, UN sanctions and Operation Desert Fox, Iraq may retain elements of its CW program. • Could start limited agent production rapidly without the presence of monitoring or sanctions. • Probably has hidden precursor chemicals, agents, munitions, and documentation for future efforts. • Has not signed the Chemical Weapons Convention.
Libya	• Employed chemical agents in 1987 against Chadian troops. • Produced blister and nerve agents at Rabta in the 1980s. • Began construction of underground chemical agent production facility at Tarhunah. • Has not signed the Chemical Weapons Convention.
Syria	• Produces and is capable of employing chemical agents. • Has not signed the Chemical Weapons Convention.
Russia	• Has the largest declared chemical stockpile in the world: 40,000 metric tons. • May be developing a new generation of chemical agents. • Has ratified the Chemical Weapons Convention.

Table 2. Chemical Weapons Programs

Our future adversaries may use a mixture of chemical agents or combine them with nuclear or biologic agents.[19] The chemical agents that are of concern today are nerve agents (tabun, sarin, soman, and VX), incapacitating agents (BZ), vesicants (mustard, lewisite, phosgene oxime), choking agents (chlorine and phosgene), and blood agents (cyanides). Our most likely adversaries are all chemical weapons proliferators.[20] Table 2 summarizes the current chemical threats.

Biological Threat

Although over 100 nations are signatories to the Biological Weapons Convention (BWC), there are serious concerns about compliance with the treaty because it does not provide for verification of compliance. Biological weapons consist of infectious agents and toxins of biological origin that may be used against combatants, civilian populations, domestic animals, or even crops. The infectious agents, also called pathogens, can be further subdivided into bacteria, rickettsiae, and viruses. Examples of pathogens useful as BW agents are anthrax, plague, smallpox, and viral encephalitis. Examples of toxins likely to be used as BW agents are Staphylococcal Entertoxin B, and Botulinum A toxin.[21]

Most BW agents can be mass-produced at minimal expense, and only small amounts are needed to produce extensive casualties. As with most chemical agents, most biological agents are nondestructive to equipment and facilities. Most importantly, biological agents are difficult to detect, and there is currently no effective vaccine or therapy for many of the biological agents.[22]

Several countries have, or are developing, a BW capability, including China, India, Iran, Iraq, Libya, North Korea, Pakistan, Russia, and Syria.[23] The production of BW agents is neither technically difficult nor does it require specialized equipment. Biological agents are far more potent when compared to chemical agents, small amounts can produce large numbers of casualties, and detection of the agent is much more difficult.

Delivery means include:

- Spray tanks carried by aircraft,
- Aerial bombs,
- Long-range missiles,
- Artillery shells, and
- Agricultural sprayers.[24]

The threat of BW has increased in the last two decades with a number of countries hostile to the United States seeking an offensive use capability. Russia now controls the program of the former Soviet Union (FSU). Intelligence reveals that this is still a robust program in spite of Russia's commitment to end further research into offensive use of BW agents. A senior BW program manager who defected from the FSU in 1992 indicated that Russia still had an ongoing research program studying genetic engineering, binary biologicals, and chimeras.[25]

The major BW agents that concern us today include: anthrax, tularemia, plague, Venezuelan equine encephalitis, Rift Valley fever, Q fever, botulinum toxin, staphylococcal toxin, and T-2 toxin.[26] Our most likely future adversaries, with the

exception of Libya, either have a BW capability or the infrastructure necessary to support a BW program.[27] Table 3 summarizes the current BW threats facing the United States.

North Korea	• Pursued biological warfare research for many years. • Possesses biotechnical infrastructure capable of supporting limited biological warfare effort. • Ratified the Biological and Toxin Weapons Convention.
China	• Possesses infrastructure necessary for BW program. • Likely has maintained an offensive BW program since acceding to the Biological and Toxin Weapons Convention in 1984.
Iran	• Possesses expertise to support BW program. • May have small quantities of agent available; seeking larger capability. • Ratified the Biological and Toxin Weapons Convention.
Iraq	• Prior to Operation Desert Storm, had the largest and most advanced program in the Middle East. • Despite Coalition bombing, UNSCOM destruction, UN sanctions and Operation Desert Fox, Iraq may retain elements of its BW program. • Could start limited agent production rapidly without the presence of monitoring. • Ratified the Biological and Toxin Weapons Convention.
Libya	• Lacks scientific and technical base. • Remains in the research and development stage. • Ratified the Biological and Toxin Weapons Convention.
Syria	• Possesses adequate biotechnical infrastructure to support a BW program. • May be conducting BW related research. • Ratified the Biological and Toxin Weapons Convention.
Russia	• Key components of the former Soviet Union's BW program remain intact in Russia. • Russia is continuing some BW related research. • Ratified the Biological and Toxin Weapons Convention.

Table 3. Biological Weapons Programs

One other distinction needs to be made when discussing BW agents. That distinction is communicable versus non-communicable disease. A communicable disease is an illness due to an agent or its products, which arises through transmission of that agent or its products from an infected person or animal to a susceptible host. Smallpox is an example of a highly communicable disease that can be transmitted directly by close contact with respiratory discharges and/or skin

lesions of patients or indirectly through recently contaminated material, such as bedding or clothing.[28]

A non-communicable disease cannot be transmitted directly from one person or animal to another person or animal. Inhalation anthrax is an example of a non-communicable disease in which the spores of the organism Bacillus anthracis must be inhaled to produce the disease. There is no evidence of person to person transmission; however, the spores are very resistant to adverse environmental conditions and may persist in contaminated soil for many years.[29]

Delivery Systems

Effective delivery systems are the key to successful use of any type of WMD. However, development of an effective delivery system often is more difficult than the production of a WMD, especially chemical or biological weapons. In order to produce the maximum number of casualties, the agent must be dispersed into a fine aerosol with a particle size of 5-15 microns. This allows for deep penetration into the lungs and prevents filtration by the body's internal defense mechanisms.[30] Potential means of delivery for NBC weapons include: ballistic missiles, cruise missiles, fighters, bombers, rockets, and tube artillery. Our most likely future foes all possess some means of weapons delivery. Table 4 summarizes the current status of the delivery systems of our most likely adversaries.[31] In addition to these systems, terrorists or nations with poorly developed delivery systems may choose simpler means, such as delivery by commercial air or truck, private air or vehicle, or even a suitcase delivered device.

North Korea	• Produces SCUD B and SCUD C missiles. • Developed the No Dong Missile (range 1,000 km) • Developing longer range missiles: Taepo Dong 1 (range 1,500 km) Taepo Dong 2 (range 4,000-6,000 km) • Not a member of the Missile Technology Control Regime. • Also has NBC capable aircraft and artillery.
China	• Produces a wide variety of land and sea based ballistic missiles. • Embarked on a modernization program. • Pledged to adhere to the Missile Technology Control Regime. • Possesses land, sea, and air-launched cruise missiles. • Also has NBC capable aircraft and artillery.
Iran	• Maintains SCUD B/C and CSS-8 ballistic missiles. • Produces SCUDs with the help of North Korea. • Not a member of the Missile Technology Control regime. • Possesses anti-ship and tactical cruise missiles. • Also has NBC capable aircraft and artillery.
Iraq	• Suffered considerable damage to its ballistic missile program during and after the Gulf War. • Allowed to maintain 150 km range missile program (Ababil). • Continues to hide SCUD missiles and portable launchers. • Not a member of the Missile Technology Control regime. • Also has NBC capable aircraft and artillery.
Libya	• Maintains an aging SCUD B force. • Does not possess long range missiles. • Not a member of the Missile Technology Control regime. • Also has NBC capable aircraft and artillery.
Syria	• Maintains SCUD B/C and SS-21 missiles. • May be able to produce SCUDs with the help of North Korea. • Not a member of the Missile Technology Control regime. • Also has NBC capable aircraft and artillery.
Russia	• Operational strategic nuclear delivery vehicles have been reduced by almost half since 1991. • Has a large SRBM force and is marketing SRBM technology. • Is a member of the Missile Technology Control regime. • Also has NBC capable aircraft and artillery.

Table 4. Means of Delivery

WMD SCENARIO

General Situation: It is now 6 August of the year 2001. The only remaining U.S. presence from the aftermath of the 1991 Gulf War is the prepositioned equipment stocks in Kuwait. Domestic dissent in Saudi Arabia forced the pullout of American troops from that country in 1999. One year later under pressure from the

Congress and the American people, the administration withdrew the remaining forces from the region.

Less than one year after the last U.S. troops withdrew from the region, Saddam Hussein moved his elite Republican Guard units to the Saudi and Kuwaiti borders. Saddam Hussein, clearly convinced that the new leaders in Washington did not have the will for another Gulf War, moved his forces south while making harsh demands on the Saudis and Kuwaitis for Iraq's fair share of the regional oil revenues. In response, the U.S. is deploying ground, naval, and air forces to the region for the 6th time since the end of the Gulf War.

Specific Situation: Newly elected President Al Gore commands U.S. forces and ordered a massive deployment to the region after consultation with our allies. A coalition consisting of U.S., Saudi, Kuwaiti, Egyptian, and British troops numbers roughly the same as it did in 1991. The only reason that that the U.S. is able to supply adequate troops is that the Korean peninsula was peacefully reunified in 1999, and the U.S. troops were restationed stateside. Subsequent to the lifting of the United Nations sanctions, Iraq has modernized its entire force structure. This armor heavy force is now deployed along both the Saudi and Kuwaiti borders.

Saddam has appeared on CNN and told the world that his country with the help of the former North Korea has developed secret weapons that will humiliate the Americans and their "pitiful" allies. He insists these weapons will be used if the Saudis or Kuwaitis permit the corrupt "infidels" to utilize their sacred Arab soil to conduct combat operations against Iraq. He asserts that Iraq is the only country in

the region that is able to resist the threat posed by the "fanatical Iranian government." He says he is willing to defend the region, but must have resources from the Saudis and Kuwaitis to be successful.

On 15 August 2001, Saddam attacks Kuwait with two armored Republican Guard and one mechanized infantry division(s) to neutralize the Kuwaiti defenses. Later that day, he attacks south into Saudi Arabia with two mechanized infantry divisions supported by one armored Republican Guard division to destroy the advanced elements of the 82nd Airborne Division that were flown into King Fahd International Airport on 14 August 1991. Simultaneously with the two ground attacks, Saddam launches air strikes into Kuwait with chemical weapons to deny the U.S. use of its prepositioned equipment and port facilities. Kuwaiti casualties are heavy, and from first reports it appears that the Iraqis used a mixture of persistent and non-persistent nerve agents in their air attacks. Facilities which they intend to occupy and use were hit with non-persistent agents while those facilities they that did not wish to use or wished to deny future use by the allies were hit with persistent agents. Further to the south in Saudi Arabia, the Iraqis attack the Saudi seaports and airfields with similar results. There was also a report of several muffled explosions over Riyadh, but no planes were observed and no explosions occurred on the ground. There were no reported casualties in the attack on Riyadh.

Requirement: You are the ARCENT staff veterinarian and have been tasked by the commander to brief the key staff on the effects of the recent CB attacks on

ARCENT's food and water supply. He wants you to include current detection capabilities inherent within the veterinary assets in theater and to make recommendations on any changes that are needed in doctrine, force structure, or equipment for the future to be forwarded to the Army's Center for Lessons Learned.

CONTAMINATION AND DECONTAMINATION

General

Food and water are susceptible to NBC contamination throughout the Theater of Operations (TO). Planning for any operation must include protection of food and water from contamination, contamination detection, and disposition of contaminated food/water (decontaminate or destroy). There are three primary countermeasures to overcome or reduce the NBC hazard to food on the battlefield. In order of priority, they are:

(1) Protection from contamination,

(2) NBC agent detection, and

(3) NBC agent decontamination.

Since initial detection of any CB attack will most likely be made at division or corps level, veterinary units will most likely be evaluating products that were in the area at the time of an attack and are suspected of being contaminated. The determination of the safety of the food and water supply may be key elements in the CINC's decision-making process for the conduct of future operations after a CB attack. Thus, the availability of rapid detection equipment in veterinary units is

essential if this information is to be provided in a timely manner. Currently, this equipment is limited to the detection of surface CW agents.

Protection

The first priority of the veterinary service should be to assist in safeguarding subsistence (primarily combat rations) and water sources from potential NBC contamination. This is of strategic importance to the CINC because if his primary food and water supplies are contaminated, he will be forced to alter the flow of material into the theater in order to sustain the force. If subsistence is adequately protected against a chemical attack, it will also be protected from biological contamination and radioactive fallout. The packaging material itself will provide some protection for combat rations. This material will be adequate for protection from vapor hazards. In general, vapor exposure to a CW agent does not result in a hazard after the vapor has dissipated. Existing packaging should be combined with enclosed or covered storage to further protect the rations from liquid hazards. Underground shelters, such as caves and tunnels, work well to protect rations if the shelter is sealed. Field expedient storage can be used if an NBC attack is expected. Man-made or natural depressions lined with plastic can be covered with sand or dirt after covering the subsistence to provide protection.[32]

In the event combat rations are not available, local food sources must be identified and food (A-rations) must be procured and protected. Personal experience and that of others in several deployments leads me to believe that there is a disconnect between our stated DoD policy of eating MREs during deployments and

combat situations and the on-the-ground commander's desire/insistence to get his troops on A-rations as soon as possible. This desire soon becomes the local policy.[33]

A safe and adequate water supply is also essential for individual and unit well being. Bottled water should be protected and issued under the same guidelines as combat rations. Deep ground water reservoirs are considered safe sources of drinking water, as are operational water supplies contained in sealed containers. Water from containers should not be used until the exterior surfaces have been decontaminated. Surface water will be contaminated as the result of a CB attack. The most dangerous potential surface water contaminants are nerve and blister agents.[34]

Detection of Contamination

Chemical. Currently, there is no fielded method for detecting chemical agents in food. Since contamination is not always evenly spread throughout food, it is impossible to take a single sample and determine the presence or absence of chemical agents in the entire lot. Standardized laboratory tests and equipment have not been fielded for determining levels of chemical agents in foods, nor have acceptable or safe levels of these compounds in food been assessed. Until a specific, reliable method of detecting chemicals in food is available, inspectors must rely on the determination of contamination on the packaging material, the integrity of the packaging material, the protective qualities of the packaging material, and the penetration characteristics of the suspected chemical agent(s).[35] As a result,

inspectors today focus on looking for gross liquid contamination on packaged products.

Chemical, medical, veterinary, and supply personnel all have responsibilities in the detection of NBC agents in water. Chemical agents almost always leave signs, including a drastic lowering of the pH and a rapid decrease in free available chlorine. Personnel may use the M272 Water Test Kit on raw water prior to chlorination to determine the presence of CW agents.[36] Although this kit is currently available, it is in short supply.

Biological. The most likely means of attack with a biological agent is via aerosol because this method is the most effective in producing large numbers of casualties. There are currently two systems fielded for the point detection of BW agents. They are the Army's Biological Integrated Detection System (BIDS) and the Navy's Interim Biological Agent Detector System (IBADS). Currently, these systems will detect four BW agents in 45 minutes. Upgrades are planned which will allow these systems to identify more agents in a shorter period of time. In addition, the Portal Shield System is being fielded to protect high value airbases and ports.[37] These detector systems will be located at higher echelons and may not be evident to the service member at company or squad level. It should be noted that questions remain about the effectiveness of these systems in significantly reducing casualties.

However, there is no fielded equipment or validated requirement for the detection of BW agents in food. Even if you detect a biological agent in subsistence,

what does that mean? Since you can't prove safety, what does a negative finding indicate about the remaining food supplies? Can we use medical diagnostic equipment already fielded for another purpose to satisfy our requirements?

Doctrine. An attack may not be recognized as an NBC attack, and its true nature may not be discovered until casualties occur. Rapid identification of CB agents is essential to the implementation of proper countermeasures. If food or water is suspect, veterinary personnel will collect the appropriate samples and transport them to the Theater Area Medical Laboratory (TAML). The TAML will provide a presumptive identification of the agent(s) and forward the samples to the supporting CONUS laboratory for confirmation.[38] The obvious shortcoming in this system is the delay in identification of BW or CW agents due to the transportation requirements for the samples and the location of the TAML. Current doctrine places the TAML at theater level or collocated with the highest-level support unit in the theater.[39] A slice of the TAML may accompany any size unit as required by the situation.

Decontamination

Our current plans for dealing with an NBC attack in certain regions do not include any plans for decontamination of subsistence or water, including combat rations. Commanders do not want to take any chance of declaring rations safe once they are contaminated with a chemical or biological agent. Plans are to dispose of the contaminated rations and push new rations and water forward. Subsistence decontamination is a low priority in this scenario. Thus, protection and detection

become even more important.[40] However, in the event of a food or water shortage, commanders may be forced into using decontaminated subsistence.

CONCLUSION

There are currently no valid warfighter requirements in the form of CINC Integrated Priority Lists (IPLs), Mission Needs Statements (MNS), or Operational Requirements Documents (ORDs) for the R&D necessary to develop the equipment needed to detect CB agents in subsistence. Once the CINC's requirements are identified and validated, the Army Medical Department (AMEDD) Center and School, through either the Medical Program Subpanel (MPSP) of the Joint Services Integration Group (JSIG) or the Needs Integration Subpanel (NIS) of the Armed Services Biomedical Research Evaluation and Management Committee (ASBREM), must generate the requirements for R&D and fielding of the necessary equipment.[41]

U.S. Army Veterinary Service doctrine is outdated and needs to be revised before any changes in force structure or equipment can be made. We must approach this problem from the battlefield doctrine, training, leader development, organization, materiel, and soldier systems (DTLOMS) point of view before we expend resources for new equipment or for research and development (R&D). Revised doctrine should include a realistic policy regarding the consumption of A-rations during military operations, an assessment of the need for CB agent detection in food (as currently exists for water), and recommendations for any force structure or MTOE changes needed to improve our response in an NBC environment.

Specifically, food and water should be treated as one entity. Inspection responsibilities for both should be given to one organization or unit instead of the artificial separation commanders must now endure. Currently, the key players in DoD food safety are the Army Veterinary Service, the Air Force Public Health Service, Navy preventive Medicine, and Army Preventive Medicine. While doctrinal publications from the services and DoD have attempted to clarify the roles of each organization, confusion still exists, especially among individuals outside the food safety arena. Thus, it is not surprising that staff officers may experience problems when developing subsistence support plans for future operations.[42]

This situation is unacceptable in today's environment characterized by highly mobile, fast paced joint operations. It could be remedied by changes in service doctrine and training, combining the 91R and 91S MOSs, or by changing the MTOE of veterinary and preventive medicine units to include the appropriate MOSs for both missions.

In conclusion, the rapid detection of CB agents in both food and water should be a priority issue for the CINCs. As the DoD Executive Agent for Veterinary Services, the U.S. Army Veterinary Service should take the initiative and ensure that this important issue is adequately addressed.

RECOMMENDATIONS

1. The DoD Veterinary Service Activity should be tasked to review the CINC IPLs and determine if a valid warfighter requirement exists for the

capability to rapidly detect CB agents in food, on food surfaces, or on food packaging.

2. The AMEDD Center and School should be tasked to update our doctrine and better define the role of the Veterinary Service in an NBC environment. The AMEDD Center and School should then document the requirements and forward them to the Chemical School for evaluation.
3. The Chemical School would determine if current fielded equipment exists in the inventory to satisfy the requirement. If there is a requirement for further R&D, then the MNS and ORDs should be developed and forwarded to the J-4 (Medical Readiness) for staffing.
4. The final step in this process would be to build either the procurement of existing equipment or future R&D into the budget through the Program Objective Memorandum (POM) process.
5. Joint Doctrine should be expanded to clearly define the lead service or activity responsible for assuring a safe food supply during military operations.
6. Food safety experts should be built into the Time Phased Force Deployment Data (TPFDD) list early in any future deployments.

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